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ABSTRACT

UNESP--Sao Paulo State University--is a successful experiment at the Multicampus University in Brazil, maintaining intense and diversified education activities in the most developed state of the Federation, the Sao Paulo State. The multicampus structure that consists of 15 university campuses and two advanced ones, distributed throughout the State of Sao Paulo, has permitted UNESP to realize an experiment in the decentralization of high-quality public education. In the area of engineering education, this university has three Engineering Colleges located at the cities Guaratingueta, Bauru, and Ilha Solteira. The three Electrical Departments at the campuses have been in a permanent process of transformation, constantly improving engineering education. These departments started in March 1997 as a cooperative project for electrical engineering education improvement at UNESP. This paper describes the project, "The Development of Multimedia Tools for the Engineering Education and Diffusion," which was developed through a partnership between the three Electrical Engineering Departments of the UNESP. Six figures of multimedia tools are included. (Author/ASK)

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A COOPERATIVE PROJECT FOR ELECTRICAL ENGINEERING EDUCATION AT UNESP – SÃO PAULO STATE UNIVERSITY

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ABSTRACT - UNESP – São Paulo State University is a successful experiment of the Multicampus University in Brazil, maintaining intense and diversified education activities in the most developed state of the Federation, the São Paulo State.

The multicampus structure, that consist of fifteen university campuses and two advanced ones, and the geographical distribution throughout the State of São Paulo has permitted UNESP to realize a experiment in the decentralization of high quality public education. In the area of engineering education, this University has three Engineering Colleges located at the cities, Guaratinguetá, Bauru and Ilha Solteira.

The three Electrical Departments at the campuses Guaratinguetá, Bauru and Ilha Solteira, have been in a permanent process of transformation, constantly improvement of engineering education. In this environment, these departments started in march/1997, a cooperative project for electrical engineering education improvement at UNESP.

This paper presents describes the project The Development of Multimedia Tools for the Engineering Education and Diffusion, that has been developed by partnership of the three Electrical Engineering Departments of the UNESP, since march/1997. The IBM Brazil has sponsored this project (AKAMATSU, 1996).

INTRODUCTION

In the search of synergy and optimization of material and human resources, the three Departments of Electrical Engineering of the UNESP initiated in March 1997 a joint project with the intention to introduce improvements, through the use of new technologies, in its courses of Electrical Engineering (AKAMATSU, 1997). This project is being developed in the scope of the UNESP, a multicampus university, and the three departments involved are located in the following campus Guaratinguetá, Bauru and Ilha Solteira. The distances among these cities are around some hundred of kilometers. In reason of the decentralization of this project, it has a General Coordinator, and each participant department of the project has a Regional Coordinator. These coordinators are responsible for the integration of the works and the management of the execution of the partnership between the departments.

Today, to work in partnership is a necessity in the modern world, where the material and human resources are scarce and with demands each time bigger for better products and services. The university education cannot be outside of this scope and needs to give an answer to the these requirements. An example in this area is the NSF - National Science Foundation in USA. These foundation finances projects of research in the engineering education, such as the Engineering Education Coalitions (NSF, 1998). They are eight coalitions, where each one of them counts approximately on eight universities or colleges, working in partnership to stimulate the creation of comprehensive, systemic models will be reform of undergraduate engineering education.

The general objective of the project is to develop research with the basic concern to use the resources of computer science and telecommunication in the planning, execution and evaluation of the education of Engineering in the UNESP, through the partnership of its three departments. The specific objectives of this project are:

(a) qualification of teaching staff interested in the development of new forms of education "in loco" and in long-distance, based on systems of computerized information, with resources multimedia and that they allow to the integration and interaction of the diverse courses of Electrical Engineering of the UNESP; and,

(b) development of education, through the creation of didactic modules, that cover topical and diversified contents of science and technology.

These objectives will be attacked in four different fronts of work:

(a) creation of an environment of multimedia, based on tools of authorship (authoring kits) with adequacy to: exploration of theoretical concepts, graphical animation of natural phenomena, graphical animation of the equipment functioning, and, systems and visualization of industrial processes,

(b) adequacy of the databases multimedia for the access of the education modules, through the net of communication, for different pupils of the campi of the UNESP, beyond professors, researchers and professors of other institutions,

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(c) to conceive, to execute and to evaluate the education methodology, and

(d) development of partnerships with other institutions of education and research, and same with companies interested in multimedia education, to optimize resources of education and its diffusion.

The main goal to be reached to the end of the project, it means after 24 months, is the development of new didactic modules, using multimedia tools, relative to the following subjects: Electrical Materials, Equipment, and, Generation, Transmission and Distribution Systems. The idea is to allow that these modules can be accessed by different students of the campi of the UNESP. As qualitative goals, it will be looked to enable professors in the use of tools and techniques to creation of modules of multimedia education, as well as the learning of these techniques for undergraduate and graduate students. It is also a goal of this project the diffusion of the knowledge gotten in the project for other undergraduate and graduate courses in Exact Sciences and same other areas of education of the UNESP, as well as for other institutions of education and research and for companies.

BASIS OF THE PROJECT

The idea of educational software is not new. The first versions of software of this sort had been conceived in the decade of 70. Recently, with the development and dissemination of computer science, also of the multimedia, the educational use of software gained new perspective and new courage. The application field is extensive, and if used well, it can decisively contribute for the significant learning of contents of different disciplines of the Engineering courses.

The effectiveness of the computer in education still receives many critical ones that, in great measure, they elapse of the not satisfactory quality of software. With the arrival of the multimedia, educational the possibilities to enrich software had increased enormously, what also it implies bigger responsibilities. The multimedia is not a product, it is a technology of resources. Currently, with relatively low investments it is possible to explore the programming techniques that allow to combine graphical images and sounds in one interactive and friendly environment. These characteristics, associates to the possibility of incorporation of routines of digital simulation of physical phenomena, make of these powerful systems instruments of support to education.

Beyond the conceptions most elementary software engineering, in the development of programs multimedia, the work in team is essential to interdisciplinary. Or either, interaction of programmers and specialists in the specific contents (engineering, physics, chemistry etc.) with professionals of the education areas, psychology and communication. It is evidenced necessity of adaptation of the conventional methods of education and transference of knowledge to the new technological realities, as the computer science and the integration of diverse educational centers and research, linked in nets. This necessity will have to lead to the development of more progressive tools of education. For in such a way, it is being proposal a new methodology of education.

The propagation of the knowledge technician, and its leveling for all the groups inside of the university, can be guaranteed through the conception of a common vehicle of spreading, having the multimedia as stimulate element for the learning. The development of such vehicle would fortify the university in its function of formation of human resources, in a more efficient and competitive way, would facilitate the update of professors in the diverse areas and would supply the technological infrastructure the training in different levels, being able to be used to advantage, still in activities of university extension involving, in a general way, the society, and particularly, the private sector.

The nets of communication of data influence in the development of the studies through the establishment of connector links between the people, exactly physically distant, allowing to the exchange of information and the development of cooperative works. Therefore, they favor the access to a great number of specialists, spread in the diverse regions, without necessity of displacement on the part of the consultants.

In addition, the use of a vehicle multimedia and nets of communication becomes the acquisition of the knowledge most attractive, with better level of absorption and retention, besides becoming it significantly faster. In general, the following general benefits to be listed:

(a) availability - the system would be to the disposal of the interested student in the education modules, allowing the attainment of the knowledge without the conventional restrictions of time of use and rigid schedule,

(b) didactic complement - lessons given in classroom could be complemented, in level of exercises and projects, with professors' aid,

(c) long-distance education - consultations to the professors, exactly pertaining to other University units, could be made through the communication net,

(d) bank of information - it would also be formed, accessible in all the University and for the private sector and society, in a general way (cultural schools, libraries, centers) through contributions of its specialists,

(e) stimulation to the learning - through audiovisual resources, the learning is stimulated significantly,

(f) synergy and standardization de contents - contribution for a basic resume standard in these courses, increasing qualitative and quantitative synergy among the departments and providing improvements of Engineering education,

(g) technological qualification - to the long one of the considered program, internally abilities in the related areas will be developed, in accord with the world-wide trend for superior education.

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(h) partnerships and interactions - cooperative works between different centers, extending perspective in programs of university extension,

(i) link between courses - promotion of the interaction accomplishes between the Engineering and the areas of Education, Communication and Computer science, and,

(j) methodology of education - creation of a new methodology of education and training of human resources of the companies, that will allow to qualification in large scale of the current ones and the future professionals, assisting and deciding some relative questions of the unemployment.

METHODOLOGY OF THE PROJECT

The work has been developed in stages involving researches, professors, undergraduate and graduate students. The following stages must be accomplish:

(a) Pedagogical qualification of the researchers in resources multimedia and techniques: This first stage of the project has the purpose to enable the involved elements in the project.

(b) Development of basic methodology for the use of authorship tools: This stage is being carried through the development of basic methodology for the use of the tools of authorship of systems multimedia and systems of generation of hypertexts, that will be used in the elaboration of education modules. The undergraduate and graduate students are being introduced in the use of these tools

(c) Development and implementation of Multimedia Modules for Education "in loco" and long-distance: The involved university units are developing referring modules of education to the areas of concentration of the professors crowded there. The idea is to get a bigger specter of covering amongst the areas of engineering education. In this stage, the responsible ones for the development of the education modules are assisted by specialists in communication and computer science of the UNESP.

(d) Integration and use of the Modules for Education: This stage has still not been initiated. It will have to be developed the integration of the different modules of education through the net of computers. Then, they will be carried through special courses "in loco" and long-distance, in reduced scale, restricted to some groups of students of the different university units. So that, it has evaluation and eventual corrections of the modules and its forms of access. In a last phase, these modules will have to be tested in a special program, under normal conditions of use.

CURRENT INFRASTRUCTURE LABORATORIAL

As each Department of Electrical Engineering involved in the project one will make responsible for the development of Didactic Modules of Education, two types of laboratories exist currently. The Laboratory of Multimedia for creation of education modules, one for each involved Department and the Laboratory of Users for students.

The Laboratories of Multimedia counts on seven PC's Pentium multimedia and adequate peripherals to the development of the education modules multimedia. These PC's support the acquisition and exhibition of video in real time, through an interface of net with high performance. These laboratories count on scanner colorful for creation of the static frames of the modules, and color printer and laser printer. They also possess software necessary for the development of didactic multimedia modules, for example, the ToolBook®. At the moment, the didactic laboratories of computer science of the involved units in the project are available for application of the modules in concrete situation of education and learning with accompaniment and control of the experience. Also, they are connected to the Internet, to serve as an instrument of support to the learning of the students.

PARTIAL RESULTS OF THE PROJECT

Four prototypes of didactic modules have been developed using the software of Toolbook (BROWN, 1992; ASYMETRIC, 1994). This software, from Asymetrix, is an environment for authorship to develop multimedia. It makes the metaphor of the book for the creation of an application. The following topics had been boarded in the prototypes: electric conductors, high-voltage techniques, cellular mobile communication systems, and electrical circuits. These modules has explored resources of audio, video, animation, and hypertext. Below some examples of screens of the developed didactic modules are shown (GOTO and SANTOS, 1997).

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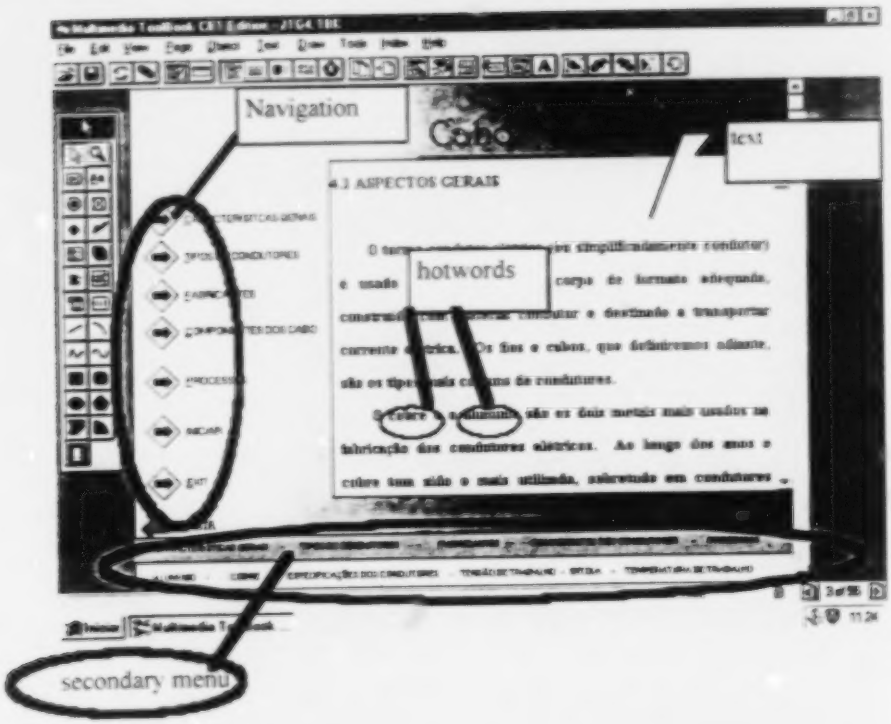

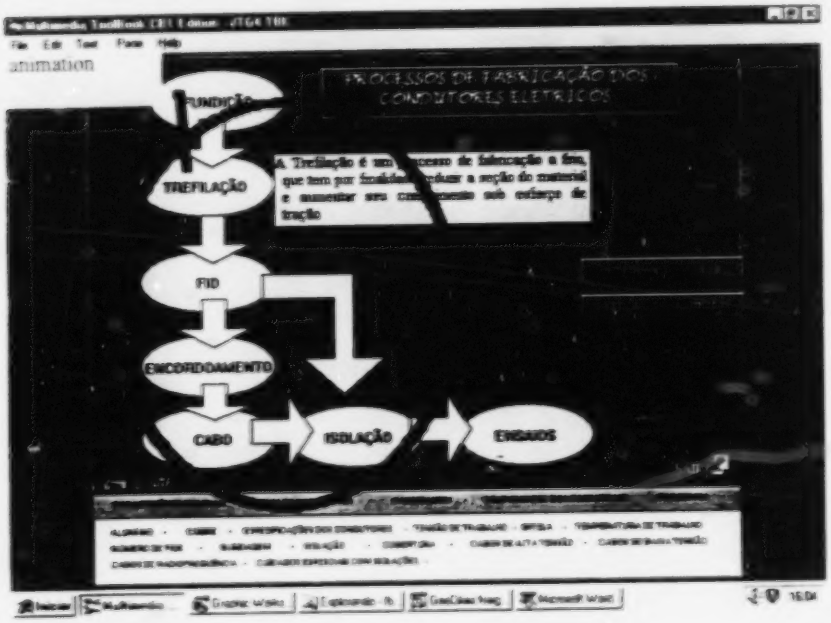

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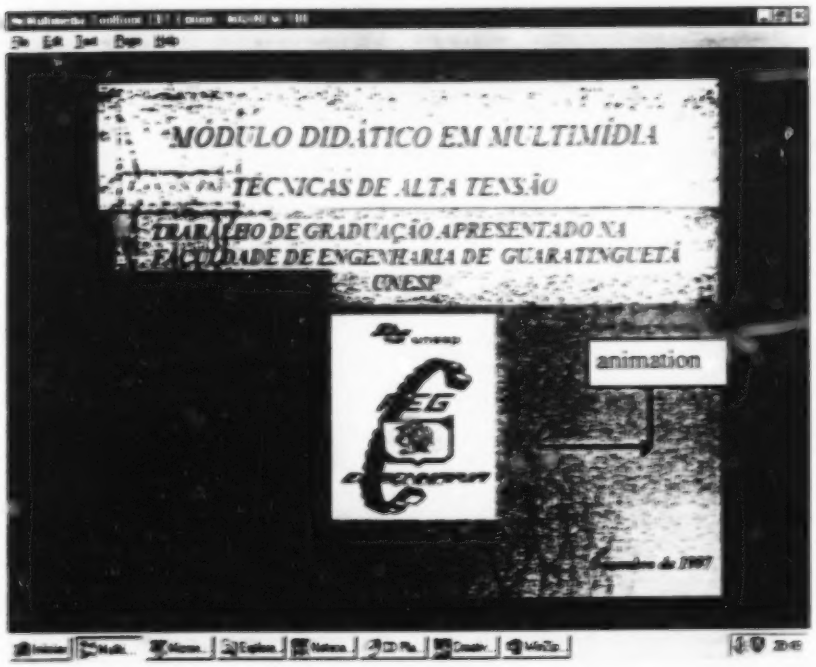

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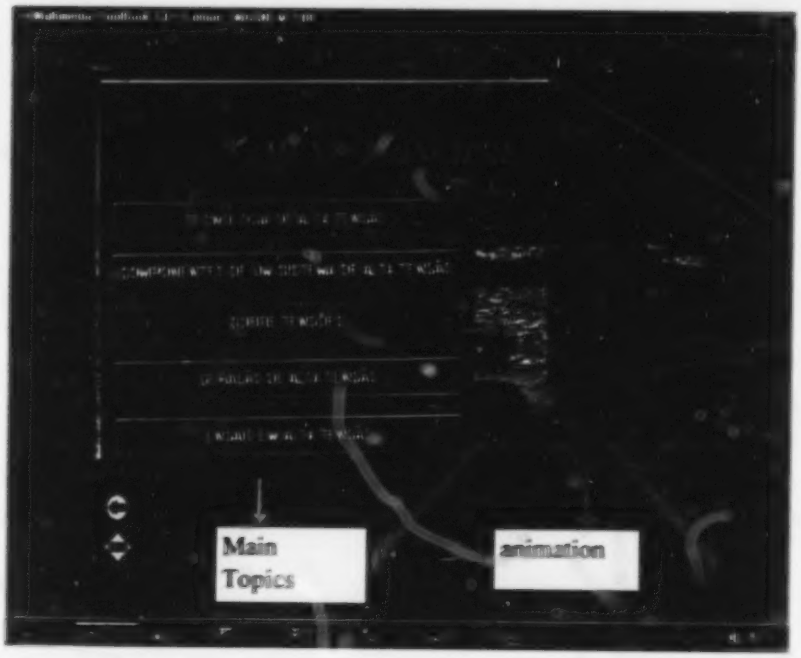

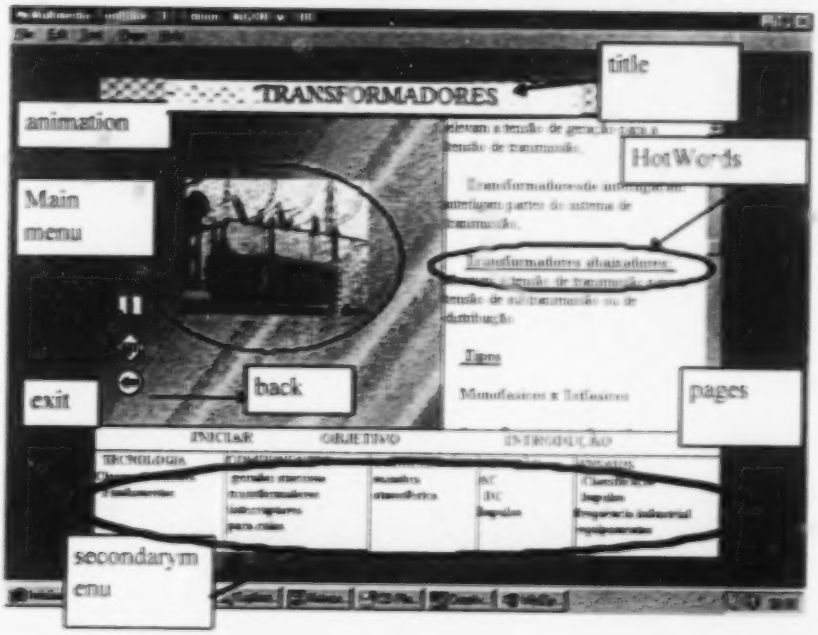

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CONCLUSIONS

The biggest target of this project is the creation of a methodology of education using new technologies. This methodology can be applied to the some areas of the knowledge, being able to be used for formal education and also for training of employees of companies.

At moment, the works developed for the participant departments of the project are promising. Therefore, some significant results of the work in partnership has been accomplish. After the end of all proposed project stages expects to promote a diffusion of the knowledge through the many involved Electrical Engineering courses and, also, for other areas of knowledge. The implication of approach is the creation of courses of training for different professors of the UNESP and the new modules of multimedia education, as in the technology used for its development.

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